STA101: Mathematics for Business and Social Sciences I – 2005/06
Answer Question 1 and any other Two Questions.

Question 1

(a) Evaluate $\sum_{n=6}^{15}\left(2^n+n\right)$.

(b) Solve the quadratic inequality $\frac{1}{2x}+\frac{9}{6x+4}<3$.

(c) Perform the indicated operation and simplify $\frac{a^2-b^2}{6a+12b}\div\frac{a^2-2ab+b^2}{a^2+4ab+4b^2}$.

(d) Given $\log_b x=\frac{3}{2}\log_b 4-\frac{2}{3}\log_b 8+2\log_b 2$, find x.

(e) Give the first five terms of the sequence $\{a_n\}=\left\{\frac{(-1)^n}{n!}\right\}$.

(f) Find the time necessary for $P230\,000$ invested at 19.5% simple interest to become $P400\,000$.

(g) The integers from 12 to 55 are added. What is their sum?

(h) Find the equation of a line which is parallel to the line $y+5x=2$ and passes through the point $(1,3)$.

(i) Define the term annuity.

(j) Among two numbers, the second number is 5 more than the first. If two times the first number is decreased by 5 we get the second number. Find the numbers.

[10x5 Marks]

Question 2

A dietician in a hospital is to arrange a special diet using two foods, L and M. Each gram of food L contains 30 units of calcium, 10 units of iron, 10 units of vitamin A and 8 units of cholesterol. Each gram of food M contains 10 units of calcium, 10 units of iron, 30 units of vitamin A and 4 units of cholesterol. The minimum daily requirements are 360 units of calcium, 160 units of iron and 240 units of vitamin A. How many grams of each food should be used to meet the minimum requirements and at the same time minimize the cholesterol intake? What is the minimum cholesterol intake? **[25 Marks]**

Question 3

(a) Alice travelled 1530 km. If her average speed had been 4 more kilometers per hour, she could have made the trip in 6 hours less time. What was her average speed?

(b) Solve the following system of linear equations by any method of your choice.
$u+v-w=2\,;\ 3u+3v+w=2\,;\ u+w=0\,.$ **[10+15 Marks]**

Question 4

(a) Find (i) the inverse of $\underline{A}$ and (ii) $|\underline{A}|$ given $\underline{A}=\begin{bmatrix}1 & 1 & 0\\ 0 & 1 & 1\\ 0 & 0 & 1\end{bmatrix}$.

(b) Let the relation R be "is greater than or equal to" on the set $A=\{11,22,35,36\}$. Represent the relation by an arrow diagram and write the ordered pairs of the relation. Determine, giving reasons, which of the reflexive, symmetric and transitive properties are satisfied by the relation. **[12+13 Marks]**

Question 5

(a) Compute the present value of an ordinary annuity in which P600 is deposited every month for 5 years. The interest rate is 10% p.a. compounded monthly.

(b) Find the future value of an ordinary annuity after 8 years in which, P200 is deposited every month with interest rate of 15% p.a. compounded monthly.

(c) What principal amount will earn an interest of P80 in 9 months at 9% simple interest per annum?

(d) The amount of P2000 is deposited in the bank at the rate of 12% interest annually. What will be the total amount after 4 years if compounded daily?

[6+6+6+7 Marks]

End of Question Paper.